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**U.S. Army Research Institute
for the Behavioral and Social Sciences**

Research Report 1517

U.S. Army Noncommissioned Officers' Academic Skills Requirements

Joan Harman

U.S. Army Research Institute

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Roy Campbell, and Kathy J. Dowd**
Human Resources Research Organization

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Research Report 1517

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Academic Skills Requirements**

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FOREWORD

The Technologies for Skill Acquisition and Retention Technical Area of the U.S. Army Research Institute for the Behavioral and Social Sciences performs research in education as part of its work program. A major focus of this research is the development of information on which the Department of the Army can base decisions about its education programs that deal with basic skills. The work described in this report was conducted under project A794, Education and Training, as part of Task 313, Improving Job Skills Education for Soldiers.

This report summarizes work carried out to address basic academic skill deficiencies in U.S. Army Noncommissioned Officers. Researchers reviewed job task descriptions and interviewed Noncommissioned Officers about on-the-job performance. They also reviewed Noncommissioned Officer Education System lesson materials and tests, monitored classes, and interviewed instructors, course managers and students. Findings will be used to develop a program of instruction the objective of which will be to correct academic skill deficiencies of Army Noncommissioned Officers.

This research was conducted under Contract No. MDA903-87-C-0735 and was supported by the Soldier Education Division, Total Army Personnel Agency, Office of the Deputy Chief of Staff for Personnel. Division staff members were provided with copies of the contractor's report during January 1989.



EDGAR M. JOHNSON
Technical Director

U.S. ARMY NONCOMMISSIONED OFFICERS' ACADEMIC SKILLS REQUIREMENTS

EXECUTIVE SUMMARY

Requirement:

A broad range of authoritative sources stipulate that Army Noncommissioned Officers (NCOs) need to be equipped with academic skills to perform all aspects of their jobs. To ensure that those who demonstrate academic deficiencies are provided with appropriate instruction, researchers must first determine the types and levels of skills needed to succeed in training, job performance, and career development.

Procedure:

Researchers reviewed job-task descriptions in Soldier, Technical, and Field Manuals and the Army Leader Requirements Task Analysis and interviewed NCOs about on-the-job performance. They also reviewed lesson materials and tests of the Noncommissioned Officer Education System, monitored classes, and interviewed instructors, course managers, and students.

Findings:

1. The greatest overall need is for lower-level academic skills, e.g., adding and subtracting whole numbers, reading and comprehending clearly-stated information, and speaking and writing in sentences.
2. Of the needed basic skills, reading to learn how to perform specific functions is required most frequently.
3. Of the three difficulty levels established--basic, intermediate, and advanced--most skill requirements are at the basic and intermediate levels.
4. Requirements for advanced skills occur in cases such as assignments to new Military Occupational Specialties or as part of NCO supervisory and leadership duties.
5. Requirements for academic skills increase as soldiers advance from grade E-5 to E-7.

Utilization of Findings:

These findings will help the U.S. Army Soldier Education Division and the Training and Doctrine Command to develop appropriate programs of instruction to serve the academic needs of NCOs.

U.S. ARMY NONCOMMISSIONED OFFICERS' ACADEMIC SKILLS REQUIREMENTS

CONTENTS

	Page
INTRODUCTION	1
PROCEDURE	2
Training	2
Job Performance	2
Leadership	4
RESULTS	4
Training	4
Job Performance	7
DISCUSSION	10
REFERENCES	13

LIST OF TABLES

Table 1. Skill category by difficulty level matrix . . .	3
2. Academic skill demands of common leader training courses, by difficulty level	5
3. Academic skill demands of NCOES technical courses, by difficulty level	6
4. Percentage of common tasks requiring academic skills at three difficulty levels	8
5. Academic skill demands of MOS-specific duty tasks, by difficulty level	9

U.S. ARMY NONCOMMISSIONED OFFICERS' ACADEMIC SKILLS REQUIREMENTS

Introduction

The Army recognizes that there are some otherwise competent soldiers who are deficient in academic skills (reading, writing, listening, oral communication, and mathematics). These deficiencies can limit soldiers' success in training, job performance, and career progression. According to Duffy (1985), "Armed forces personnel must operate and maintain some of the most sophisticated, costly, and dangerous equipment in existence. Because of both the complexity of this equipment and the massive number of personnel who must be trained each year, literacy is perhaps more critical in the armed forces than in any other segment of our society." Therefore, as more technologically complex weapons and equipment are added to the Army's inventory, the burden on the Army to ensure that soldiers are adequately equipped with basic academic skills grows greater. This is particularly true for Noncommissioned Officers (NCOs) because it is these personnel who are responsible for conducting training. As Sergeants' Business (1986) points out, "An NCO's ability to learn, teach, train, mentor, solve problems, act independently, have and inspire confidence, and motivate others are all dependent on. . .basic educational skills."

In addition to ever increasing job complexity, a factor that further exacerbates the concern about basic academic skills is an expected decline in available manpower. Demographic projections to the year 2000 predict a substantial decline in the prime accession age group during the next decade (Oxford-Carpenter, Pol, & Gendell, 1984; Bureau of the Census, 1983/84; Sticht & Mikulecky, 1984; Binkin, 1986). This reduction in the recruitment pool can be expected to result in pressure to lower recruitment standards, thus increasing the gap between job demands and academic skill levels. Clearly, then, the Army must take steps to identify academic skills needs for success in training, job performance, and career development, and to provide programs to meet those needs.

During 1988, staff members of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) tested soldiers who were attending classes at NCO Academies (Harman, Bell, Sneed & Sabol, 1988). A substantial proportion of these soldiers failed to meet the criterion reading grade level established by Army Regulation 621-5. The authors recommended that the Army provide programs of instruction to refresh unused academic skills and/or to instill unlearned skills.

At the present time, no formal basic academic skills programs exist that address the particular needs of NCOs. Important first steps in the direction of developing such programs include identifying, systematically, academic skills

needed for successful training, job performance and career progression. This report summarizes research carried out during 1987 and 1988 under contract with HumRRO to fulfill that requirement (see Gagne, Hickey, Rositol, Campbell and Dowd, 1988).

Procedure

Researchers selected four high-density Military Occupational Specialties (MOSs) that represent Combat Arms, Combat Support and Combat Service Support jobs for use in this effort. These MOSs are 11B (Infantryman), 13B (Cannon Crewmember), 63B (Light Wheel Vehicle Mechanic), and 31C (Single Channel Radio Operator). In order to categorize academic skills required for training and job performance, the model developed by Sticht, Fox, Hauke and Zapf (1977) shown in Table 1 (drawn from Gagne et al., 1988) was adopted. This model provides seven categories of academic skills with three gradations of difficulty for each category.

Training

To assess academic requirements for success in training, researchers traveled to NCO Academies at Fort Benning, Fort Sill, Aberdeen Proving Ground and Fort Gordon. They obtained curricula and tests used in the Primary Leadership Development Course (PLDC), the Basic Noncommissioned Officer Courses (BNCOC) and the Advanced Noncommissioned Officer Courses (ANCOC), all of which are part of the Noncommissioned Officer Education System (NCOES). They identified academic elements in the materials, and rated them on the type and difficulty criteria described in Table 1. Researchers verified each others' ratings, then the ratings were verified by a Subject Matter Expert (SME), and, finally, they were verified by instructors at the Academies. In addition, they interviewed 32 instructors, 11 students and 8 course manager/developers, as well as monitoring 13 Academy classes including ANCOC classes covering the Army Writing Program.

Job Performance

Researchers acquired Soldier's Manuals, Technical Manuals and Field Manuals that described job tasks for Skill Levels 1 through 4 in the selected MOSs. All Common Soldier tasks were explored to determine and rate academic content. MOS-specific tasks were selected on the basis of tasks that not only incorporate academic skills, but also are critical tasks that are performed frequently. Researchers' ratings were verified by 39 SMEs assigned to units at the Army posts visited.

Table 1

Skill Category by Difficulty Level Matrix

MATHEMATICAL COMPUTATION

Basic Arithmetic. Add, subtract, multiply, and divide whole numbers

Advanced Arithmetic. Work with fractions, decimals, percentages, and formulas.

Algebra. Perform operations that require an understanding of algebra.

Words. Give information in words or phrases.

Sentences. Generate whole sentences on forms or formatted narratives. Use correct punctuation, grammar, and spelling.

Prose. Generate paragraph(s) of original prose. Consider compositional elements.

Words. Give information in words or phrases.

Sentences. Speak in complete sentences, but with no need to prepare in advance.

Prepared. Prepare and give a briefing or other oral presentation.

READING-TO-DO

Basic. Use readily available, simple information on job aid, or follow simple instructions.

Intermediate. Locate easy-to-find information in books, diagrams, etc., and/or follow moderately complex instruction.

Advanced. Interpret tables, graphs, schematics, and/or locate difficult -to-find information in text passages, and/or follow multipath procedures.

Basic. Read and learn content at the memorization level.

Intermediate. Read and learn content in a familiar domain at the comprehension level.

Advanced. Read and learn content in an unfamiliar domain at the comprehension level.

Basic. Follow simple instructions and procedures.

Intermediate. Follow moderately detailed instructions and procedures. Listen actively, ask questions.

Advanced. Follow detailed or multipath instructions or procedures.

LISTENING-TO-LEARN

Basic. Learn content at the memorization level.

Intermediate. Learn content in a familiar domain at the comprehension level.

Advanced. Learn content in an unfamiliar domain at the comprehension level.

Leadership

Steinberg and Leaman (1988) administered a survey called The Army Leader Requirements Task Analysis to 4198 NCOs at Skill Levels 2, 3 and 4 assigned to all Army MOS. Their objective was to identify leadership, not academic, tasks performed by NCOs. However, many task titles specifically describe academic skills (for example, "Write Enlisted Evaluation Reports"), whereas others, while incorporating academic requirements, are less specific about the skills required (for example, "Advise Superiors on Leadership Issues"). Still other leadership tasks involving such requirements as train, motivate, explain, tell, counsel, recommend, manage, etc., clearly require academic skills although it is not possible to rate these skills precisely on the basis of type and difficulty. Nonetheless, the critical and frequently performed leadership tasks included in the survey are of sufficient importance to effective job performance for researchers to attempt to estimate the academic requirements for leadership tasks needed by NCOs.

Results

Training

PLDC consists of classes in Common Leader Training that are the same from Academy to Academy. BNCOC and ANCOC consist of both Common Leader Training and MOS-specific Training. These differing types of curricula will be treated separately.

Common Leader Training

Table 2 (drawn from Gagne et al., 1988) shows the percentage of course hours that include academic elements for Common Leader Training broken down by difficulty level (difficulty levels are displayed in the Table as 1 basic, 2 intermediate and 3 advanced). Only six academic skills are included in the Table. Listening-to-Learn is not included because it is universally present across classes. The most prevalent academic demand is for Reading-to-Do followed by Writing. Mathematics, Speaking and Listening-to-Do show low percentage demands. In-class Reading-to-Learn demands are virtually non-existent. Across all skills, academic demands are highest for ANCOC and lowest for PLDC. In terms of difficulty levels, the greatest demand is at the basic level, followed by the intermediate level, with a much lower demand for advanced skills.

MOS-Specific Training

Table 3 (drawn from Gagne et al., 1988) shows the percentage of course hours that include academic elements for MOS-specific Training broken down by difficulty level. Only

Table 2

Academic Skill Demands of Common Leader Training Courses, by Difficulty Level

JES Courses		Percentage of Course Hours Containing Academically Demanding Elements at Each Difficulty Level																							
Course	Hours ^{a, b}	Math			Writing			Speaking			Reading-To-Do			Reading-To-Learn			Listening-To-Do			Average, All 6			Average, "Critical 3"		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
PLDC	137 (53.15C; 88PE; 1.8TV; 6PEX; 4D; 4E)	2.3			1.2; 0.2			1.1; 1.8; 0.4			4.9; 2.5; 1.5						0.4; 2.1; 0.2			1.7; 1.1; 0.4			2.8; 0.9; 0.5		
BNCOC	38 (28.25C; 3.75PE; 3TV; 3E)	2.8			2.9; 1.8			3.7			4.2; 9.2						0.4; 0.2			1.7; 2.5			3.2; 3.7		
ANCOC	104 (56C; 34PE; 6PEX; 8E)	1.4			3.0; 2.5; 3.4			1.5; 0.7			9.8; 4.2; 0.3						0.1; 1.4			2.4; 1.5; 0.7			4.7; 2.2; 1.2		
All Courses	279 (137.4C; 105.75PE; 4.85TV; 12PEX; 4D; 15E)	2.1			2.4; 1.5; 1.1			0.4; 2.4; 0.4			6.3; 5.3; 0.8						0.3; 1.2; 0.1			1.9; 1.7; 0.4			3.6; 2.3; 0.8		

^a Totals are from lesson review sheet, not POIs.

^b Course content abbreviations are as follows: C, Conference; PE, Practical Exercise; TV, Television; PEX, Practical Examination; D, Demonstration; E, Examination.

^c "Critical Three" skills are Math, Writing, and Reading-To-Do.

Table 3

Academic Skill Demands of NCOES Technical Courses, by Difficulty Level

Technical Courses		Percentage of Course Hours Containing Academically Demanding Elements at Each Difficulty Level																									
Course	Hours ^a	Math			Writing			Speaking			Reading-To-Do			Reading-To-Learn			Listening-To-Do			Average, All 6			Average ^b "Critical 3"				
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3		
11BBNCOC	138				0.7	0.7		52.2	2.2	15.2							34.6	14.5		17.1	2.9				5.3	0.2	
11BANCOC ^c	384	3.4	1.5		7.6	2.7		11.7		1.8	12.0	0.2					25.7			10.1	2.4	0.3				7.7	4.8
31CBNCOC	166																										
31CANCOC	512.25	3.8	1.2		10.8	1.8		7.2	12.0	18.2	30.7	3.0	0.8	2.4			6.6	10.6		7.9	9.5	0.8				10.9	10.6
		3.8	3.4		34.2	2.7		15.4		18.3	38.7	14.4					1.4	2.5	8.1	12.4	8.8	3.4				18.8	14.9
63BBNCOC	297.9	4.9	9.2	1.0	17.2	1.1		1.0	9.1	14.6	40.1	3.2					0.3	9.3	0.3	6.3	11.5	0.8				12.3	16.8
63BANCOC	81	7.4	1.2		3.7			5.8		13.6	14.8	9.9					2.5	1.2		5.0	3.1	1.9				8.2	5.3
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	
AI BNCOC	601.9	2.8	3.5	0.3	9.6	0.6	0.6	20.1	7.8	18.3	23.6	2.1	0.2	0.8			13.9	11.6	0.1	10.5	8.0	0.5				9.5	9.2
AI A NCOC	977.25	4.9	2.1		15.2	1.8		10.9		14.6	21.2	8.1					0.5	9.4	3.5	9.2	4.8	1.8				11.6	8.4

^a Totals are from lesson review sheet, not POIs.

^b "Critical Three" skills are Math, Writing, and Reading-To-Do.

^c Examination elements are not included.

three of the selected MOS are presented in the Table. MOS-specific curriculum materials for 13B were not available at the time this research was underway. Once again, Listening-to-Learn was so universally required across classes that its inclusion in the Table would be uninformative. Reading-to-Do is the most demanded skill, followed by Speaking, Listening-to-Do, Writing, and Mathematics. In common with the Common Leader Training course analysis, the greatest academic skill demands occur at the basic level, followed by the intermediate and then the advanced level. However, the overall demand for academic skills is substantially higher for the MOS-specific portions of BNCOC and ANCOC than for Common Leader Training. Also, the total demand for academic skills is higher for BNCOC than for ANCOC, although more advanced skills are needed for ANCOC than for BNCOC.

The Army Writing Program

This program of instruction is provided to soldiers attending ANCOC classes. Researchers' examination of the curriculum revealed that most of the writing skills taught would be classified at the advanced level of difficulty. However, interviews with instructors indicated that a substantial part of their efforts must be devoted to providing students with instruction at the basic and intermediate levels of writing skills.

Job Performance

Common Soldier Tasks

Table 4 (drawn from Gagne et al., 1988) shows the percentage of Common Tasks (those tasks that every soldier must learn; for example, rifle marksmanship) for Skill Levels 1 through 4 that include academic skills broken down by difficulty level. The most prevalent academic demand is for Reading-to-Do, followed by Speaking and Mathematics. A small percentage of tasks involve Writing and Listening-to-Do. None of the Common Tasks requires Reading-to-Learn or Listening-to-Learn. The greatest requirement is for tasks at the basic difficulty level, then at the intermediate difficulty level. Only Reading-to-Do, Speaking, and Writing appear in the advanced skills category.

MOS Tasks

Table 5 (drawn from Gagne et al., 1988) shows academic skill demands for MOS tasks broken down by difficulty level. As with the Common Tasks, Reading-to-Learn and Listening-to-Learn are not required. The greatest demand for academic skills is for Reading-to-Do, followed by Mathematics, Writing, and Speaking. The only MOS for which this general pattern didn't hold was 13B for which Mathematics needs were greater than reading needs. Difficulty levels are shown most often in the basic and intermediate categories. The need for advanced skills tends to

Table 4

Percentage of Common Tasks Requiring Academic Skills
at Three Difficulty Levels*

Skill Level	Math			Writing			Speaking			Reading-to-Do			Listening-to-Do		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1 (N=79)	8 (6)			3 (2)	1 (1)		4 (3)	1 (1)		4 (3)	6 (5)		1 (1)		
2 (N=21)	19 (4)	5 (1)					10 (2)		10 (2)		24 (5)	10 (2)	10 (2)	5 (1)	
3 (N=18)	22 (4)			6 (1)	6 (1)	6 (1)	6 (1)	22 (4)	6 (1)	6 (1)	17 (3)		17 (3)		
4 (N=11)	9 (1)			18 (2)	9 (1)		18 (2)	9 (1)		18 (2)			9 (4)		
TOTAL (N=129)	12 (15)	1 (1)		4 (5)	2 (3)	1 (1)	5 (6)	5 (7)	3 (4)	3 (4)	12 (15)	2 (2)	2 (3)	4 (5)	

*Numbers in parentheses indicate number of tasks.

Table 5
Academic Skill Demands of MOS-Specific Duty Tasks, by Difficulty Level^a

Course			Percentage of Tasks Containing Academically Demanding Elements at Each Type and Difficulty Level																							
MOS	Skill Level	No. Tasks ^b	Math			Writing			Speaking			Reading-To-Do			Reading-To-Learn			Listening-To-Do			Listening-To-Learn					
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3			
11B	1 & 2	13	31						8	8		31	31					8	8							
	3	7	29			43			29			29						14								
	4	4	50			50	50					50	25	25				50								
	All	24	33			21	8		4	13	8	21	29					4	17							
13B	1 & 2	10	20			20			20			20	10					10								
	3	6	50	17		17	17		17			17	67					17								
	4	11	100			9			9	9		45						27								
	All	27	59	4		15	4		11	7		11	37					19								
31C	1 & 2	24	4	8		29			25	4		4	46	13												
	3	3	33			67			67			100														
	4	23	35	26		22	4		70			74	4					39								
	All	50	20	16		28	2		48	2		2	62	8				18								
63B	1 & 2	15	33			7			13	7		27	33					7								
	3	11	55			36	36	9	36			27	36	18												
	4	10	30			40	10	10	10	10		40	50	10												
	All	36	39			25	14	14	6	14	6	19	36	22				3								
All	1 & 2	62	19	3		5	11		8	11	3	11	32	13				5	2							
	3	27	44	4		30	26	4	33			15	48	7				4	4							
	4	48	50	13		15	17	10	2	38	6	10	58	4				6	23							
	All	137	35	7		13	16	4	4	25	4	12	45	9				5	9							

^a Sets of MOS-specific tasks determined to be most critical to NCOs at corresponding rank.

^b Refers to number of tasks analyzed in project (not total number in MOS).

concentrate in the Combat Support (63B) and Combat Service Support (31C) MOSs. Overall, however, a higher percentage of academic skills are needed for MOS Tasks than for Common Tasks. The Table also shows a rise in academic skill requirements as Skill Levels increase.

Leadership Tasks

Researchers' estimates of the academic requirements to perform these tasks indicate that they fall into the intermediate and advanced difficulty categories. They include such sophisticated demands as comprehending complex information, writing original prose and preparing original speeches. An additional indication is that the demand for such skills increases with rank.

Discussion

The most distinctive result of the assessment of NCOs' academic requirements is that there is a substantial need for effective reading skills. Furthermore, NCOs need to be able to handle Mathematics, Writing and Speaking tasks. The academic requirements for training performance resemble those for job performance, particularly in that, in both cases, MOS demands are greater than Common tasks demands. Also, academic requirements increase as Skill Levels increase for both training and job performance. For example, course objectives for ANCOC dictate a higher level of understanding/comprehension of class topics (as opposed to gathering and disgorging facts) than for BNCOC or PLDC. Correspondingly, the most marked example in terms of job performance is the 40% increase in the requirement for mathematics skills from Skill Level 2 to Skill Level 4 shown in Table 5.

In terms of Leadership tasks, all indications are that more advanced academic skills are needed for successful performance. In this case, too, demands grow greater as NCOs advance in their careers.

The overall conclusion to be drawn from this research is that NCOs can perform the majority of training and job tasks if they are equipped with basic and intermediate levels of academic skills. For Leadership tasks, however, they require fairly sophisticated levels of these skills. There are at least two indicators that some NCOs are deficient in academic skills. Harman et al. (1988) reported that substantial numbers of these soldiers fail to meet the Army reading grade level criterion. Interviews with instructors of the Army Writing Program raise questions about whether pre-program preparation might allow soldiers with limited writing abilities to achieve maximum benefit from it. Programs to address NCOs' academic deficiencies, therefore, might be most effective if they establish a firm foundation of basic academic skills on which

these soldiers can build to accommodate increasing demands as they progress in their careers.

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